WHAT IS CLAIMED IS:

1. A method for forming a gas cluster which comprises the steps of mixing a substance liquid at the room temperature under the atmospheric pressure and a pressurized gas, and causing the resultant mixture to spout as a gas from a nozzle to generate a cluster which is a lumpy group of atoms or molecules.

2. A method as claimed in claim 1, wherein said substance liquid at the room temperature under the atmospheric pressure is an oxygen-containing compound.

3. A method as claimed in claim 1 or 2, wherein said substance liquid at the room temperature under the atmospheric pressure is an organic metal compound.

4. A method as claimed in any one of claims 1 to 3, wherein said substance liquid at the room temperature under the atmospheric pressure is $Ti(i - OC_3H_7)_4$.

5. A method as claimed in any one of claims 1 to 4, wherein said pressurized gas is an inert gas or a reactive gas.

6. A method as claimed in any one of claims 1 to 5, wherein said nozzle is an expansion-type nozzle.

7. A method for forming gas cluster ions, which comprises the step of ionizing the gas cluster formed by the method as claimed in any one of claims 1 to 6.

8. A method as claimed in claim 7, wherein said ionization is accomplished by irradiating an electron beam.

9. A method for forming a thin film, which comprises the step of irradiating the cluster ions formed by the method as claimed in claim 7 or 8 onto a substrate surface, thereby forming a thin film.

10. A method as claimed in claim 9, wherein said cluster ions are accelerated by acceleration voltage.

11. A method for forming a thin film, which comprises the steps of forming a cluster which is a lumpy group of atoms or molecules of a reactive substance gaseous at the room temperature, irradiating cluster ions ionized therefrom onto a substrate surface, and at the same time or alternately, irradiating a single, or a plurality of, component gas of a deposit film onto the substrate surface to cause reaction of the both, thereby depositing a thin film on the substrate surface;

wherein two or more gases to be irradiated simultaneously are fed after converting same into clusters.

12. A method for forming a thin film, which comprises the steps of forming a cluster which is an annular group of atoms or molecules of a reactive substance gaseous at the room temperature, irradiating cluster ions ionized therefrom onto a substrate surface, and at the same time or alternately, irradiating a single, or a plurality of, component gas of a deposit film onto the substrate surface to cause reaction of the both, thereby depositing a thin film on the substrate surface; wherein at least one of the gaseous reactive substances to be converted into cluster is an oxygen-containing substance.

13. A method for forming a thin film a claimed in claim 11

or 12, wherein an oxide film is deposited by irradiating cluster ions of a gas containing oxygen and at least an organic metal compound gas onto the substrate surface.

14. A method for forming a thin film as claimed in any one of claims 11 to 13, which comprises the steps of irradiating oxygen gas cluster ions onto the substrate, and at the same time, or alternately, irradiating a single, or a plurality of, component gas of deposit film onto the substrate surface to cause reaction of the both, thereby depositing a thin ferroelectric film on the substrate surface.

15. A method for forming an oxygen-containing gas cluster, which comprises the step of causing an oxygen-containing pressurized gas mixed with a rare gas to spout from a nozzle to form a gas cluster.

16. A method as claimed in claim 15, wherein said nozzle is a cooled expansion-type nozzle.

17. A method for forming an oxygen-containing gas cluster, which comprises the step of ionizing the gas cluster formed by the method as claimed in claim 15 or 16.

18. A method for forming a thin film, which comprises the step of irradiating the cluster ions formed by the method as claimed in claim 17 onto a substrate surface, thereby forming a thin film.